

# **PROCESSING DIETS FOR MASS REARING OF INSECTS**

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# PROCESSING DIETS FOR MASS REARING OF INSECTS

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Equipment, shown in figure 1, to mix and sterilize economically large amounts (up to 68 gallons per hour) of insect diet is described in this paper. The equipment was developed to prepare diet for mass rearing the corn earworm, *Heliothis zea* (Boddie), at the Southern Grain Insects Research Laboratory, Tifton, Ga. It can, however, be used for many insect diets; the number and amount of ingredients do not affect its operation.

Dry ingredients are placed in a triangular hopper (76 by 91 by 91 centimeters) and raised to a mixer by a 10-centimeter screw elevator. The 500-pound-capacity batch mixer is a combination paddle-and-ribbon mixer. A mechanical leverage door in the bottom of the mixer allows emptying into a 1,000-pound capacity storage bin designed for nonbridging. Problems with bridging at the outlet of the storage bin can be overcome by aeration, vibration, or changing position of the bucket pickup.

Mixed ingredients are taken from the storage bin and fed into a metering unit by an automatically controlled bucket elevator.

The elevator is used in the metering unit to

prevent separation of the mixed ingredients. Low- and high-level switches start and stop the elevator to maintain the level of ingredients in the metering-unit hopper.

The metering unit is a Vibra-Screw live bin feeder with an 84.9-liter live hopper, a vibrating trough and screw, and a mechanical variable-speed drive. Vibration of the ingredients insures a steady uninterrupted flow of materials into the trough and preconditions them to a constant density. These conditions result in a feeder output proportional to the rotational speed of the screw. This unit is the key to maintaining a uniform finished diet.

From the metering unit the dry ingredients pass into a reservoir, where they are mixed with water. The quantity of dry ingredients in the diet is controlled by adjusting the speed of the rotating screw in the metering unit. The volume of water entering the system is regulated by a float valve located in a reservoir. The valve allows replacement of all water used in the system. The viscosity of the diet is governed by varying the amount of dry ingredients entering the reservoir. Liquid ingredients may also be metered into the reservoir.

A 1-horsepower centrifugal pump (recycle) mixes the ingredients and water in a semi-closed system to maintain the in-

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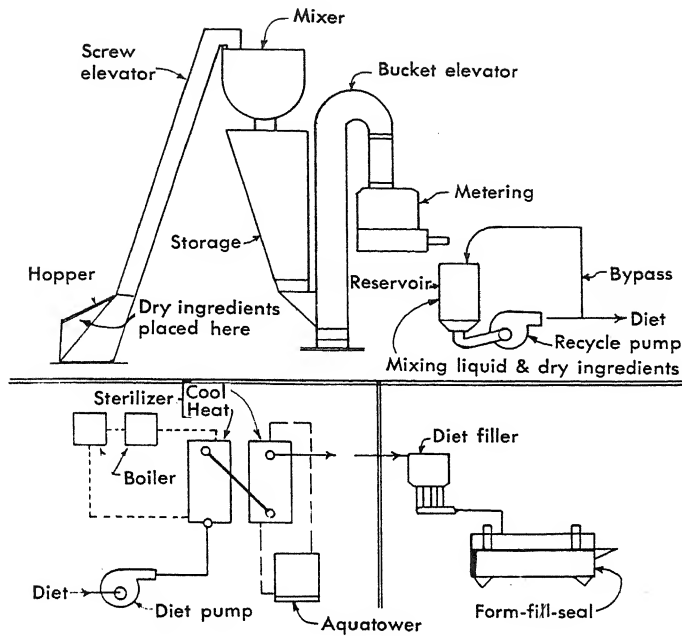


FIGURE 1.—Diet-processing equipment.

gredients in suspension. The recycle pump recirculates about 90 percent of the water and ingredients, and the remaining 10 percent of the diet is shunted into the sterilizing system by a variable-speed,  $\frac{3}{4}$ -horsepower, Moyno pump.

The diet is sterilized by a scraped-surface heat exchanger (Contherm Corp., model 6X4-2). There are two heat exchanger cylinders—one for heating and one for cooling. Diet pumped into the heating cylinder is heated to the sterilizing temperature by steam from a 48-kilowatt electric boiler. The temperatures are controlled manually or hydraulically with Taylor instruments through a modulating steam valve. The diet moves continuously through the sterilizing cylinder into the second cylinder for cooling. Water

recirculated through the cylinder and an aquatower removes the heat from the diet to the desired temperature. The aquatower has a 1.5-horsepower recirculating centrifugal pump and a 1.0-horsepower fan.

Cool, sterile diet pumped into the diet filler is metered into rearing cells produced on a form-fill-seal machine, ready for insects to begin feeding. A switch controls the quantity of diet in the diet filler. It stops the diet pump and feeder without interfering with other components of the system. When the filler has capacity for more diet, the diet pump and feeder start again, and diet begins to flow.

Additional information on this equipment may be obtained from the authors.

### ACKNOWLEDGMENT

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